

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 14 May 2001 (14.05.01)	
International application No. PCT/SE00/01633	Applicant's or agent's file reference 2001880
International filing date (day/month/year) 24 August 2000 (24.08.00)	Priority date (day/month/year) 24 August 1999 (24.08.99)
Applicant NILSSON, Nils, Lennart	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 23 March 2001 (23.03.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
 34, chemin des Colombettes
 1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Catherine Massetti

Telephone No.: (41-22) 338.83.38

REC'D 19 JUL 2001

WIPO

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PC-2001880	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SE00/01633	International filing date (day/month/year) 24.08.2000	Priority date (day/month/year) 24.08.1999
International Patent Classification (IPC) or national classification and IPC ₇ E01C 23/06, E02F 7/06, B07B 1/22		
Applicant Nimek Industries Nya Aktiebolag et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 23.03.2001	Date of completion of this report 27.06.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Örjan Nylund / MRo Telephone No. 08-782 25 00

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE00/01633

I. Basis of the report**1. With regard to the elements of the international application:***

- ☒ the international application as originally filed
- ☐ the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the drawings:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.These elements were available or furnished to this Authority in the following language English which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☒ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE00/01633

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims	<u>1-5</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-5</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-5</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The documents cited in the International Search Report represent the prior art. The claimed invention stated in claims 1-5 is not considered to be anticipated by these documents. None of the documents or any relevant combination of them reveal a mobile gravel sorter as described by these claims.

According to the arguments stated above, the invention claimed in claims 1-5 is novel, considered to involve an inventive step and have industrial applicability.

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
1 March 2001 (01.03.2001)

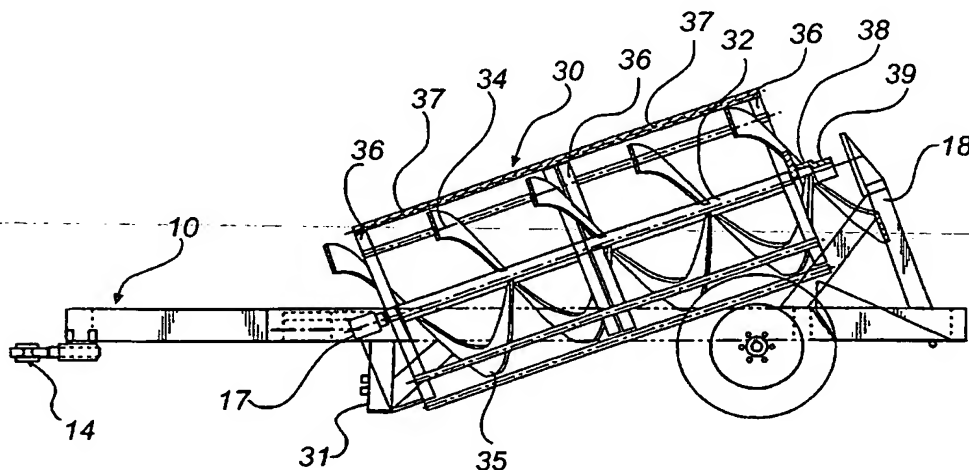
PCT

(10) International Publication Number
WO 01/14643 A1

- (51) International Patent Classification⁷: E01C 23/06, (74) Agent: AWAPATENT AB; BOX 5117, S-200 71 Malmö (SE).
E02F 7/06, B07B 1/22
- (21) International Application Number: PCT/SE00/01633 (81) Designated States (*national*): AE, AG, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KR (utility model), KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (22) International Filing Date: 24 August 2000 (24.08.2000)
- (25) Filing Language: Swedish
- (26) Publication Language: English
- (30) Priority Data: 9902985-2 24 August 1999 (24.08.1999) SE
- (71) Applicant (*for all designated States except US*): NIMEK INDUSTRIES NYA AKTIEBOLAG [SE/SE]; Box 153, S-830 47 Trångsviken (SE).
- (72) Inventor; and
- (75) Inventor/Applicant (*for US only*): NILSSON, Nils, Lennart [SE/SE]; Wolfsgatan 2, S-962 32 Jokkmokk (SE).
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:
— With international search report.

[Continued on next page]

(54) Title: GRAVEL SORTER



(57) Abstract: A mobile gravel sorter, which is arranged to move in a direction of travel along a road, comprising a gathering unit which is arranged to gather up granular material from a roadway as the gravel sorter moves in the direction of travel, a sorting unit (30) for sorting and supplying to the roadway the amount of the material that is smaller than a given grain size, and a collecting unit for collecting material exceeding said given grain size. The sorting unit (30) comprises a substantially circular drum which is arranged after the gathering unit in the direction of travel and which has a centre axis (32), an inlet means in connection with the gathering unit and an outlet means which is arranged in connection with the collecting unit and separated from the inlet means in the longitudinal direction of the drum, at least one screw conveyor (34, 35) which extends in the drum between the inlet means and the outlet means about a helical axis which is substantially concentric with the centre axis (32) of the drum, and a screen cloth means (37) which is arranged to cover openings in the circumferential surface of the drum.

WO 01/14643 A1



— *Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

GRAVEL SORTERTechnical Field

The present invention relates to a mobile gravel sorter, which is arranged to move in a direction of travel along a road, comprising a gathering unit which is arranged to gather up granular material from a roadway as the gravel sorter moves in the direction of travel, a sorting unit for sorting and supplying to the roadway the amount of the material that is smaller than a given grain size, which sorting unit comprises a substantially circular drum which is arranged after the gathering unit in the direction of travel and which has a centre axis, an inlet means in connection with the gathering unit and an outlet means which is arranged in connection with the collecting unit and separated from the inlet means in the longitudinal direction of the drum, a collecting unit for collecting material exceeding said given grain size, and a screen cloth means which is arranged to cover openings in the circumferential surface of the drum.

Technical Background

As described in the brochure "road maintenance bare ground" issued by the National Swedish Road Administration, the wearing course of a gravel road is worn and ground down under the action of traffic and grading. The coarse material is crushed to a sandy material. The fine material dusts away and some of the gravel material is thrown out on the embankment. The wearing course is transformed into gravel which is sensitive to corrugation and has an excess sand fraction. After some time, the gravel road has such poor standards as concerns the composition and thickness of the wearing course and a reduced runoff of surface water that it is necessary to take measures to improve the wearing course and the water runoff.

A well-balanced cycle of measures to maintain acceptable runoff of surface water and a correct composition of the wearing course is important to obtain the lowest possible total cost of gravel road maintenance.

5 Today, there are about 284,000 km private roads in Sweden which are covered with a new layer of gravel year after year. This results in high costs and has a considerable impact on the environment, since gravel is getting scarce. The gravel that has been spread out on
10 the roads has not disappeared, but most of it has been pressed out into the ditches.

According to prior-art methods and by using prior-art road machines, the maintenance is carried out by adding gravel and stone material having a fraction of
15 4-18 mm, which is the ideal size of the gravel and stone material in order to obtain a satisfactory bearing capacity, and possibly by cutting the edges of the roadway and drawing up the thrown-out material. The material that has slid down the embankment has a relatively high
20 share of material with a size in the upper range of said fraction and therefore it is of great interest to recover this material.

The drawn-up material sometimes comprises a high amount of turfs and contains relatively large stones,
25 and herefore it cannot be used directly since such a composition of material on the road would result in a road with too poor a bearing capacity.

In the brochure "road maintenance bare ground", two different ways of treating the drawn-up material
30 are described.

According to the first alternative, the line of drawn-up material is loaded into the vibrating grate bucket of a wheel loader, by means of which too large stones and turfs are sorted out. After sorting, the
35 remaining material is emptied onto the surrounding ground, where possible. This method requires a road grader, which cuts the edges of the road and draws back

the material, and a wheel loader with a vibrating grate bucket, which means that two drivers are needed.

According to the second alternative, use is made of a so-called stone picker (schematic view, see Fig. 6).

5 The stone picker is attached directly to the road grader or pulled by a separate tractor running after the road grader. Such a stone picker, which is designed to pick up stones in a field, has a number of arms rotating about a shaft which is arranged parallel to the surface of the
10 ground and transversely of the longitudinal direction of the road. The arms encounter stones and turfs in the line of drawn-up material and throw them into a container. When the turfs are thrown into the container, a great amount of gravel is entrained.

15 According to the first alternative, a succession of machines and thus a number of drivers are required. According to the second alternative, too large quantities of gravel disappear.

SE-451,207 discloses a sorting machine for immediately reusing road gravel in material originating from
20 road maintenance, such as material from graded road sides and edges. The sorting machine has a collecting assembly which collects the material, a conveyor belt which conveys the material from the collecting assembly up to a
25 tumbler which is horizontally arranged and which separates the road gravel and puts it down on the roadway. The sorting unit further has a second conveyor belt which conveys undesired stones and the like from the collected material up to a container. The sorting unit is provided
30 with a motor and is self-propelled. Also this construction requires two operators, one driving the road grader and another driving the sorting unit.

Both the stone picker and the sorting unit are insufficient in case irregular quantities of material have
35 been graded off along the road. They are not capable of levelling the quantities along the road, and the separated roadway gravel will also be spread out irregularly.

Summary of the Invention

One object of the present invention is to provide a solution of the above-mentioned problems.

Another object is to provide a solution which requires as few persons (drivers) as possible and which
5 minimises the need to add new gravel.

These objects are achieved by means of a mobile gravel sorter, which is of the kind stated by way of introduction and which is characterised in that the
10 sorting unit comprises a substantially circular drum which is arranged after the gathering unit in the direction of travel and which has a centre axis, an inlet means in connection with the gathering unit and an outlet means which is arranged in connection with the collecting
15 unit and separated from the inlet means in the longitudinal direction of the drum, at least one screw conveyor which extends in the drum between the inlet means and the outlet means about a helical axis which is substantially concentric with the centre axis of the drum, and a screen
20 cloth means which is arranged to cover openings in the circumferential surface of the drum.

Preferred embodiments of the invention are stated in the dependent claims.

In the radial direction, the screw conveyor advantageously has an extension that is smaller than the inner
25 radius of the drum and extends from the inside of the circumferential surface of the drum so that an axially directed return chamber forms about the centre axis between the inlet and the outlet means of the drum. As a
30 result, it will be possible, when a great amount of material is fed into the gravel sorter, for the amount of the material that exceeds the volume of the defined space to be returned to preceding helical turns, and therefore there is time for all the material to be processed and
35 passed through the meshes of the screen cloth.

Preferably, the drum and the screw conveyor are arranged to rotate together as one unit. Consequently,

the problem of material getting stuck between two elements that are movable in relation to each other is avoided, which prevents the sorting unit of the gravel sorter from jamming.

5

Brief Description of the Drawings

Below, the invention will be described in more detail with reference to the accompanying schematic drawings, which for the purpose of exemplification show
10 a presently preferred embodiment of the invention.

Fig. 1 is a side view of the mobile gravel sorter.

Fig. 2 shows the mobile gravel sorter with removed cover from the side.

Fig. 3 shows an example of how the mobile gravel
15 sorter can be connected to a tractor.

Fig. 4 shows the drum and the screw conveyor of the mobile gravel sorter seen from the inlet along their centre axes.

Fig. 5 shows the drum and the screw conveyor of the
20 mobile gravel sorter in cross-section in a view similar to that in Fig. 4 at a distance from the inlet.

Fig. 6 shows a stone picker according to prior-art technique.

25 Description of a Preferred Embodiment

The main components of the gravel sorter comprise a chassis 10, a gathering unit 20, a sorting unit 30 and a collecting unit 40 (see Figs 1 and 2).

The chassis 10 consists of a Y-shaped frame structure 11-13 and is arranged to be connected to a road
30 grader, tractor, wheel loader or the like, via a coupling 14 at the end of the leg 11, which is the single part of the Y and arranged in the front part of the chassis. Two wheels 15, 16 are mounted on the two spaced-apart legs
35 12, 13 of the Y arranged in the rear part of the chassis, thus making the gravel sorter roll along the road that is to be worked.

The gathering unit 20 is composed of sections 21, 22 which are arranged to gather the material in the line of drawn-up material and convey this material to the inlet opening 31 of the sorting unit 30.

5 The sorting unit 30 is secured to its centre shaft 32 and rotates therewith (see Figs 2, 4 and 5). On this centre shaft 32, two struts 33 are mounted opposite to each other in the radial direction at three places, namely at the two ends and in the middle. The struts 33
10 in turn support two flanges 34, 35 which in a helical line each, in the radial direction at a distance from the centre shaft 32, extend along the centre shaft 32. The struts 33 project a short distance from the helically shaped flanges 34, 35 and support a ring 36 (one at each
15 end and one in the middle of the longitudinal direction of the centre shaft). These rings 36 form three circular outlines of a cylinder, and on these rings 36 a self-supporting screen cloth 37 is secured so that they are interconnected and so as to form a cylindrical drum. The
20 screen cloth 37 is made of woven 5 mm spring steel and the size of its meshes is approximately 10% greater than the desired maximum size. The thus formed sorting unit 30 has a shape which is similar to that of a nut having two thread starts. The struts 33 project a short distance
25 from the flanges 34, 35, which results in a gap being formed between the outer material (the screen cloth 37) and the threads (the flanges 34, 35) which gap is bridged
by the struts 33.

30 The sorting unit 30 is suspended from the chassis 10 so that the projection of its centre shaft 32 on the roadway is parallel to the direction of travel, with an inclination of about 20° in relation to the horizontal plane so that its front end is located below its rear end. The front end of the centre shaft 32 is arranged to
35 fit into a seat 17 placed in the chassis 10 approximately where the single leg of the Y merges with the other two legs. At the other end, the centre shaft 32 is supported

by the chassis 10 by means of an upright frame structure 18.

At the rear end of the centre shaft 32, a planetary gear 38 is arranged having a hydraulic motor 39 mounted directly thereon. The planetary gear 38 and the motor 39 are dimensioned to function as a support for supporting the sorting unit 30. This results in a simple and robust system which only requires a simple recess in the frame structure 18 of the chassis 10, in which recess the motor 39 and the planetary gear 38 are placed, after which the motor 39 is non-rotatingly secured by means of bolts.

The oil pressure of the hydraulic motor 39 is supplied via a quick coupling connected to the hydraulic system of the traction vehicle and lines arranged in the chassis 10.

In the radial direction, the helical flanges 34, 35 have an extension which is smaller than the distance between the centre shaft 32 and the screen cloth 37 and are arranged adjacent to the screen cloth 37 (with a small gap), which results in an open space being formed in the middle of the drum about the centre shaft 32 (see Fig. 5). However, precisely at the start of their helical shape, the flanges 34, 35 have an extension in the radial direction that is only slightly smaller than the radial distance between the centre shaft 32 and the screen cloth 37. This design has been found to be advantageous for the feeding and retaining of material.

At the rear end of the chassis 10 of the gravel sorter, a collecting unit 40 is arranged. This collecting unit 40 receives the material which has not passed through the meshes of the screen cloth 37 during the time and along the distance that the material has been worked and conveyed through the sorting unit 30. The collected material, for instance, large stones, grass roots and parts of plants, constitutes material that is not desirable in the base of the road, since it has a negative

effect on the bearing capacity of the base or the wearing course.

The mobile gravel sorter described above is above all intended to be used in the maintenance of existing gravel roads, where the aim is to recover the gravel which has slid down the embankment due to road traffic and the action of the weather. The material that has slid down the embankment is drawn up by means of a scraper or grader mounted on a tractor or road grader and gathered in a line on the road. The traction vehicle of the gravel sorter passes over the line of material which is gathered by the gathering unit 20 of the gravel sorter and further conveyed into the sorting unit 30. In the rotating sorting unit 30, the material is further conveyed upwards by means of the helical movement of the flanges 34, 35. Stones and gravel having a size that is smaller than a given size falls through the meshes of the screen cloth 37 down on the road. During the time when the material passes through the sorting unit 30, all turfs are broken up, the gravel bound thereto being released and falling down on the road. Large stones and plant parts do not fall through the screen cloth 37 and are further conveyed to the collecting unit 40.

Since there is an open space about the centre shaft 32, material can fall back to the beginning of the sorting unit, in case the compartments, which are defined by the angle of repose of the material, the screen cloth 37 and the flanges 34, 35, get overfull. This ensures that all the material has actually managed to be worked and had the chance to fall through the screen cloth 37 before it is conveyed to the collecting unit 40. Since the screen cloth 37 only lets through a certain amount of material per time unit (or stretch of a road at a constant speed along the road), the free space also has a levelling effect, which prevents the sorting unit 30 from being jammed and ensures that approximately the same amount of material is delivered along the stretch of the road. As already mentioned,

the flanges 34, 35 in the first part of their windings or turns have a radial extension such that the free space is much more limited, which causes the material sliding back to be retained in the sorting unit 30 (see Fig. 5).

5 By constructing and using the sorting unit 30 in this manner, such a great amount of the gravel material which has slid down the embankment is recovered that in many cases it is not necessary to add any new material to the wearing course of the road.

10 The collecting unit 40 can be operated and emptied by means of a hydraulic piston 41. In many cases, the easiest way of emptying the collecting unit 40 is simply to reverse the gravel sorter so that the collecting unit 40 is outside the road and also outside a possible ditch,
15 and then just emptying the material.

To make it possible to turn to such an extent that the gravel sorter can be placed at such an angle when reversing, the traction vehicle should have relatively good manoeuvrability. A suitable constellation is the use
20 of a wheel-mounted road grader which is connected to the front of a tractor or wheel loader and a gravel sorter which is arranged to be suspended from the three-point lifting means of the tractor (see Fig. 3). This constellation is then capable of drawing up the material from
25 the embankment by means of the grader and returning this material to the road by means of the gravel sorter. When the collecting unit 40 of the gravel sorter is to be emptied, the grader can be lifted up and thus the traction vehicle can turn relatively sharply and move the
30 gravel sorter off the road. The collecting unit is opened and the entire gravel sorter is tipped by means of the three-point lifting means of the tractor. This constellation makes it possible for one person to maintain a road in one trip and reuse the embankment material.

35 It goes without saying that in cases where it is not possible or suitable from the point of view of nature protection to empty the gravel sorter directly at the

roadside it can be emptied in a tractor bucket or the like.

It will be appreciated that a number of modifications of the embodiment of the gravel sorter described
5 herein for the purpose of exemplification are possible without departing from the scope of the invention, which is defined in the appended claims.

CLAIMS

1. A mobile gravel sorter, which is arranged to move
5 in a direction of travel along a road, comprising

a gathering unit (20) which is arranged to gather
up granular material from a roadway as the gravel sorter
moves in the direction of travel,

a sorting unit (30) for sorting and supplying to the
10 roadway the amount of the material that is smaller than a
given grain size, which sorting unit comprises a substan-
tially circular drum which is arranged after the gather-
ing unit in the direction of travel and which has a
centre axis (32), an inlet means in connection with the
15 gathering unit (20) and an outlet means which is arranged
in connection with the collecting unit (40) and separated
from the inlet means in the longitudinal direction of the
drum,

a collecting unit (40) for collecting material ex-
20 ceeding said given grain size, and

a screen cloth means (37) which is arranged to cover
openings in the circumferential surface of the drum,
c h a r a c t e r i s e d i n

that the sorting unit (30) further comprises at
25 least one screw conveyor (34, 35) which extends in the
drum between the inlet means and the outlet means about
a helical axis which is substantially concentric with the
centre axis (32) of the drum,

that the main elements of the screw conveyor com-
30 prise at least one radially directed flange (34, 35)
which describes a helical line inside the drum,

that the radially directed flange of the screw con-
veyor in the radial direction has an extension that is
smaller than the inner radius of the drum and extends
35 from the inside of the circumferential surface of the
drum so that an axially directed return chamber forms

about the centre axis (32) between the inlet and outlet means of the drum,

that the projection of the centre axis (32) of the drum on the roadway is directed substantially parallel to the direction of travel of the gravel sorter, the inlet means mainly consisting of an open drum end, which is the front end in the direction of travel, and the outlet means mainly consisting of an open drum end, which is the rear end in the direction of travel, and

that the centre axis (32) of the sorting unit (30) is inclined in relation to the horizontal plane so that its front end is lower than its rear end.

2. A gravel sorter as claimed in claim 1, in which the drum and the screw conveyor rotate together.

3. A gravel sorter as claimed in claim 1 or 2, in which the circumferential surface of the drum mainly consists of said screen cloth means (37).

4. A gravel sorter as claimed in any one of the preceding claims, in which the sorting unit comprises a supporting, rotating shaft (32) which is concentric with the centre axis of the drum and which supports the screw conveyor and the drum.

5. A gravel sorter as claimed in any one of the preceding claims, in which the inclination of the centre axis (32) of the sorting unit (30) is about 20° in relation to the horizontal plane.

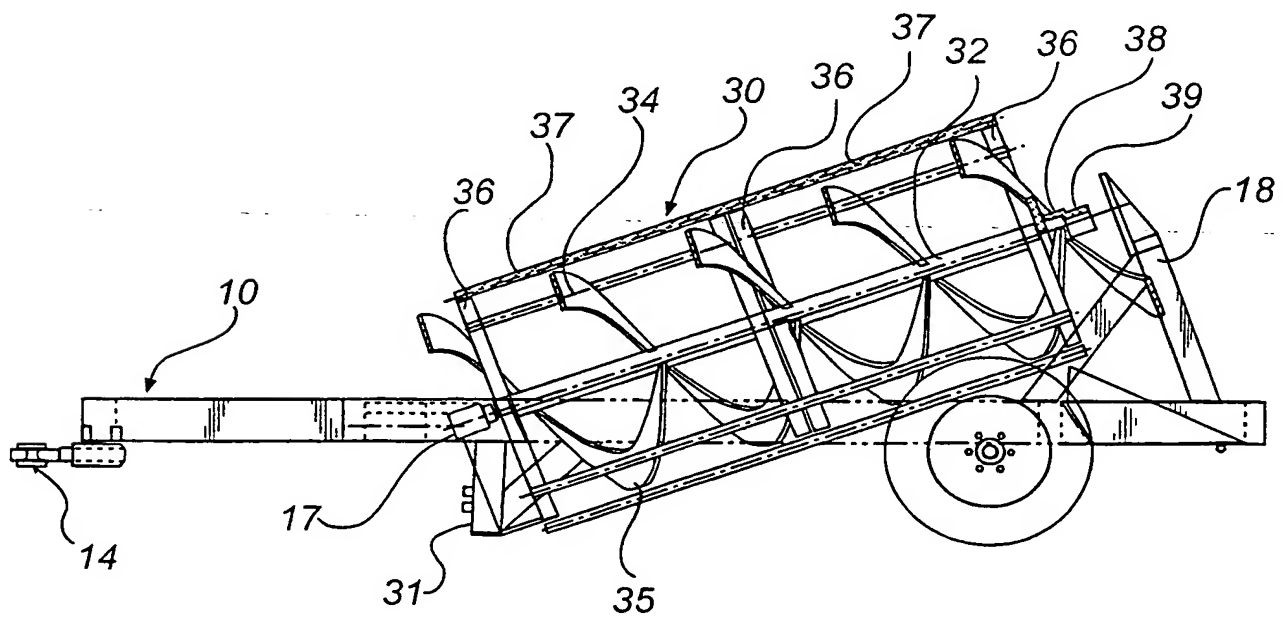
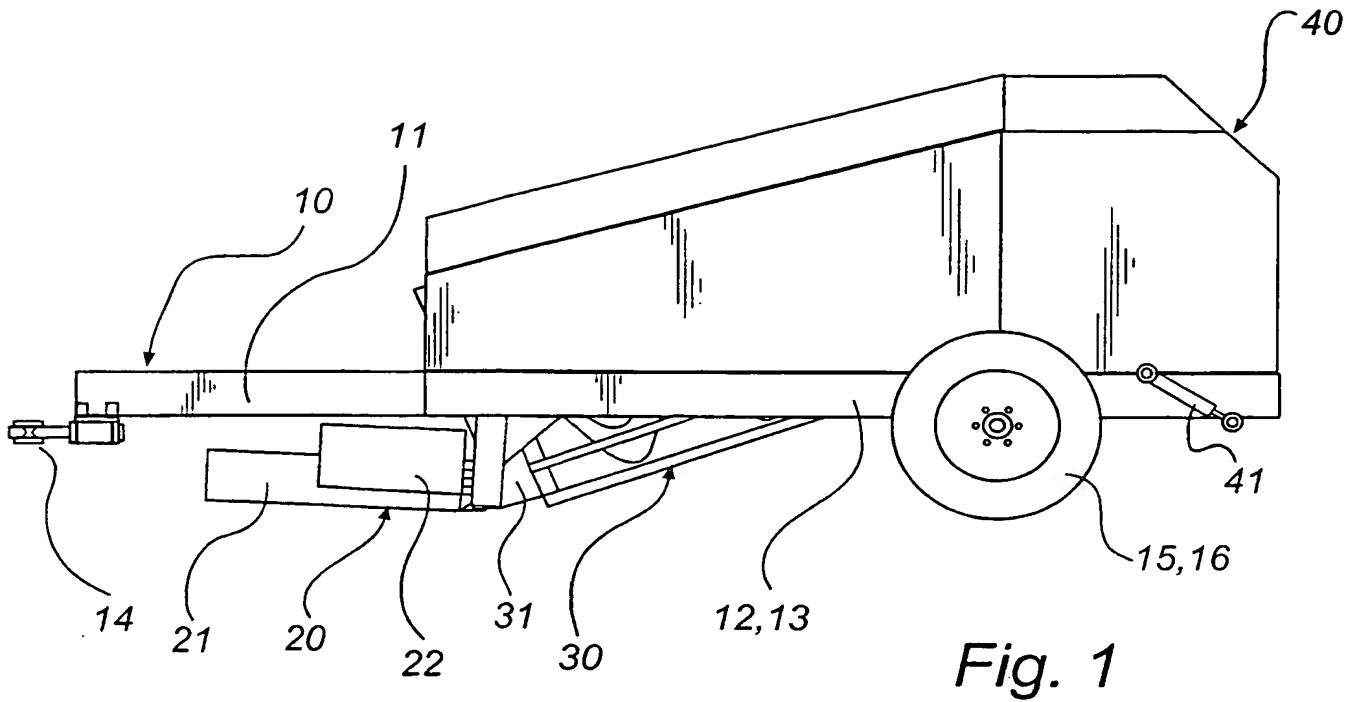


Fig. 3

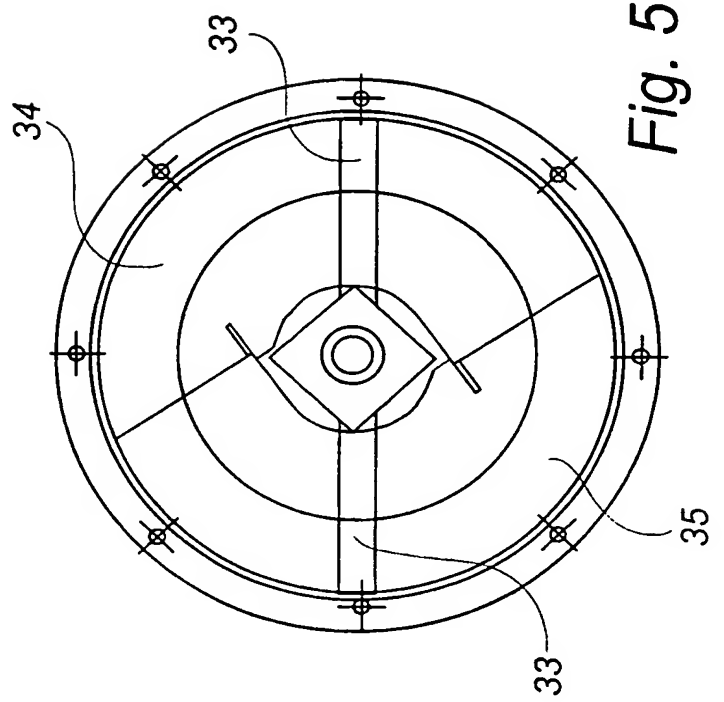
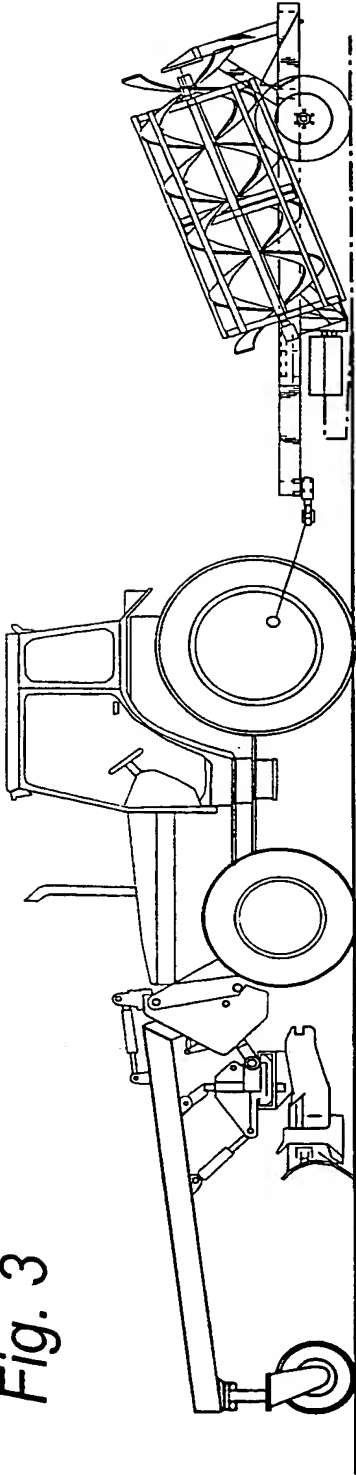


Fig. 5

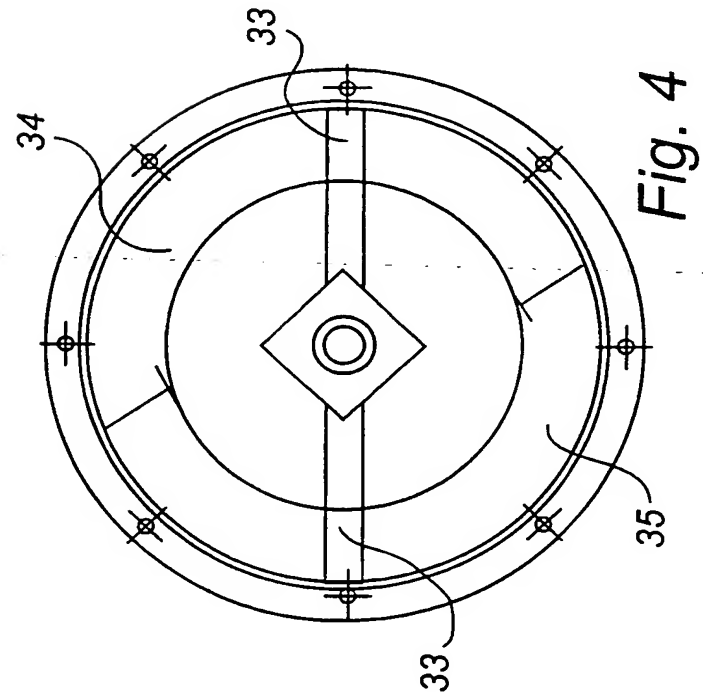


Fig. 4

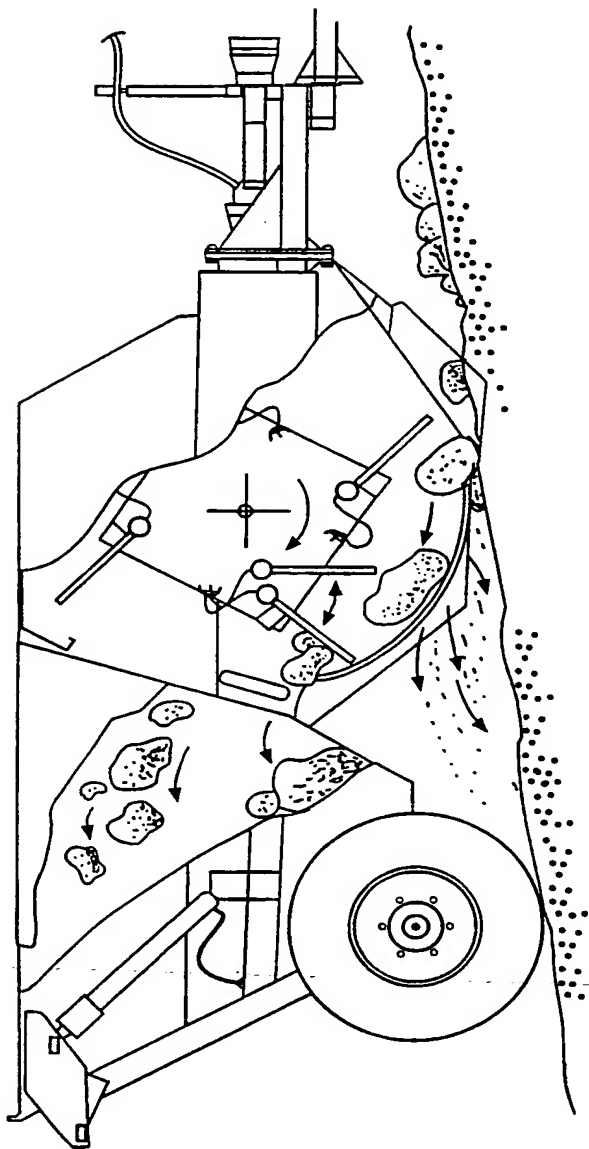


Fig. 6 (Känd teknik)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/01633

A. CLASSIFICATION OF SUBJECT MATTER		
IPC7: E01C 23/06, E02F 7/06, B07B 1/22 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC7: E01C, E02F, B07B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE,DK,FI,NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SE 451207 B (ALVHEMS MEKANISKA VERKSTAD AB), 14 Sept 1987 (14.09.87), page 2, line 20 - line 24, abstract, details 1,3,5,32 --	1-5
A	GB 2188567 A (KENNETH METHVEN GRACEY), 7 October 1987 (07.10.87), abstract, detail 22 --	1-5
A	AU 41762/85 B (JOHN MANDIC), 31 October 1985 (31.10.85), abstract, detail 17 -- -----	1-5
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
11 December 2000		20 Dec- 2000
Name and mailing address of the ISA: Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86		Authorized officer Örjan Nylund/mj Telephone No. + 46 8 782 25 00

INTERNATIONAL SEARCH REPORT
Information on patent family members

04/12/00

International application No.
PCT/SE 00/01633

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
SE	451207	B	14/09/87	SE	8305652 A	15/04/85

GB	2188567	A	07/10/87	GB	8608398 D	00/00/00
				GB	8708320 D	00/00/00

AU	41762/85	B	31/10/85	NONE		



IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

(15) Information about Correction:

see PCT Gazette No. 10/2002 of 7 March 2002, Section II

Published:

— *with international search report*

(48) Date of publication of this corrected version:

7 March 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

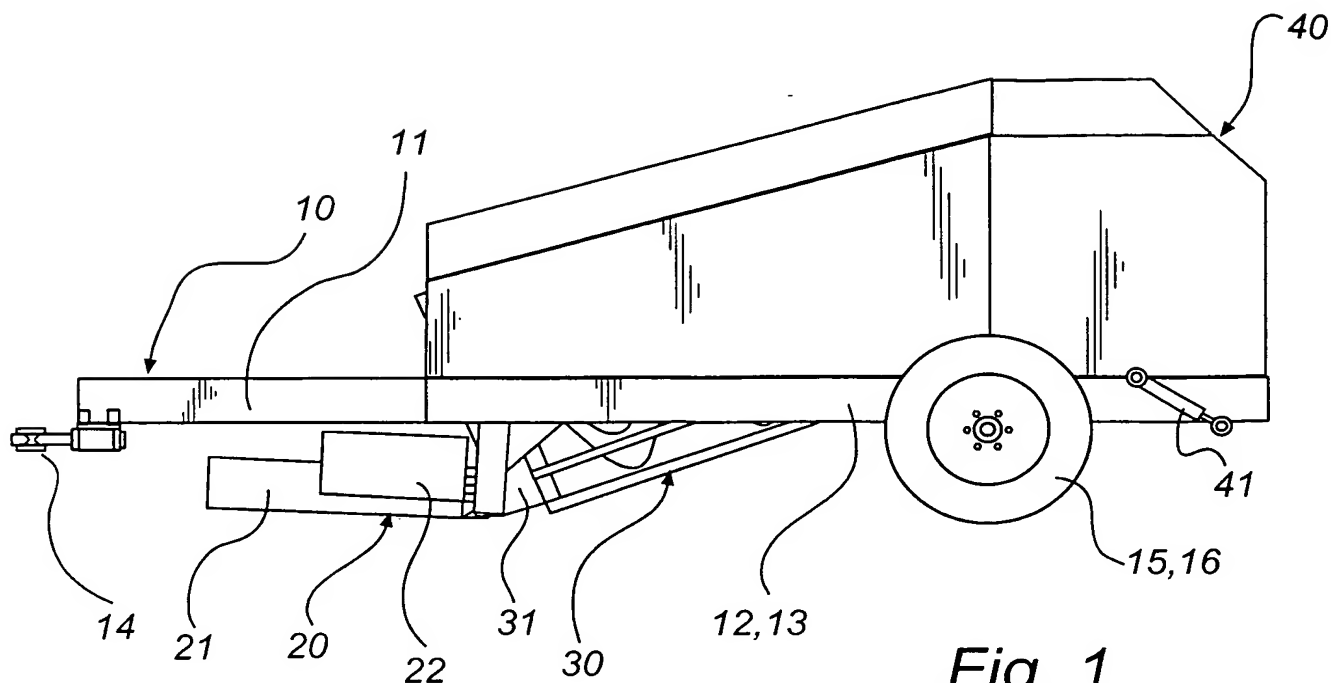


Fig. 1

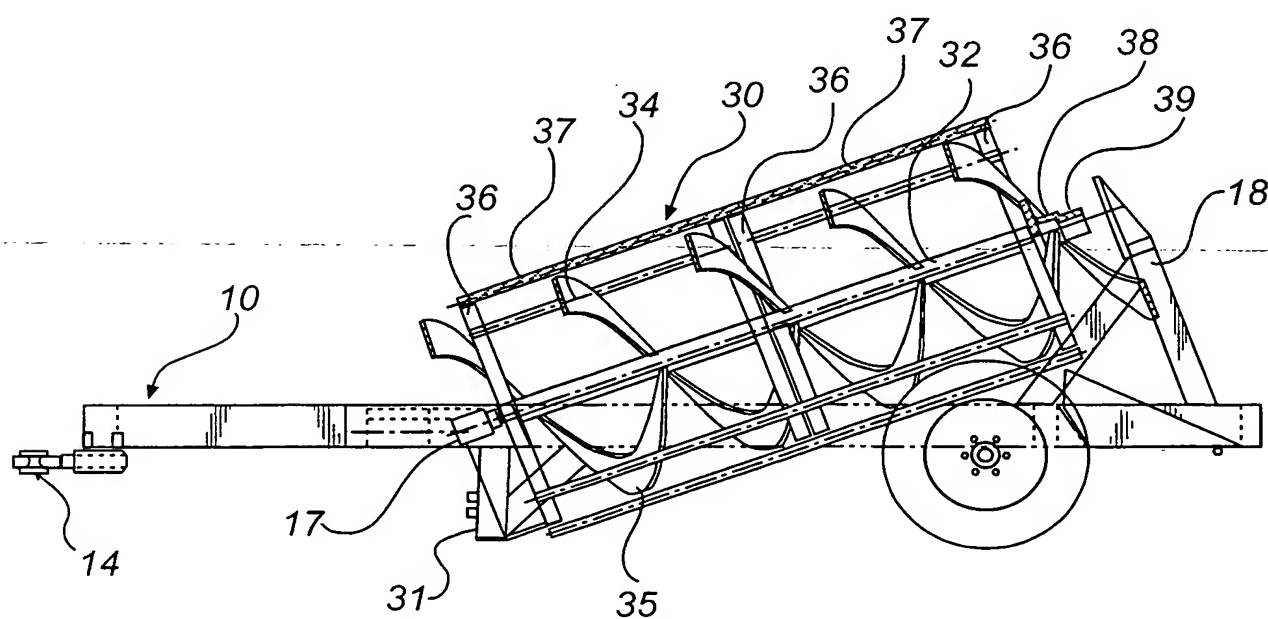


Fig. 2

Fig. 3

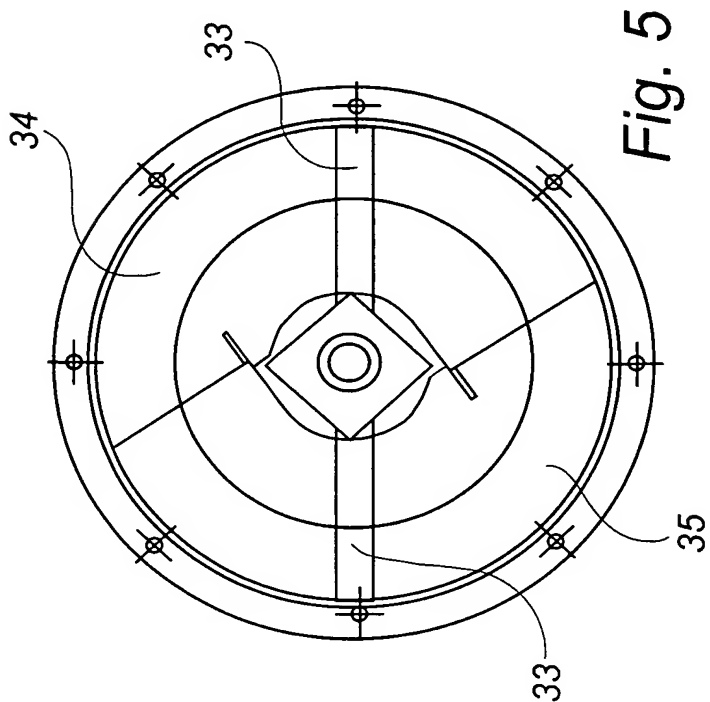
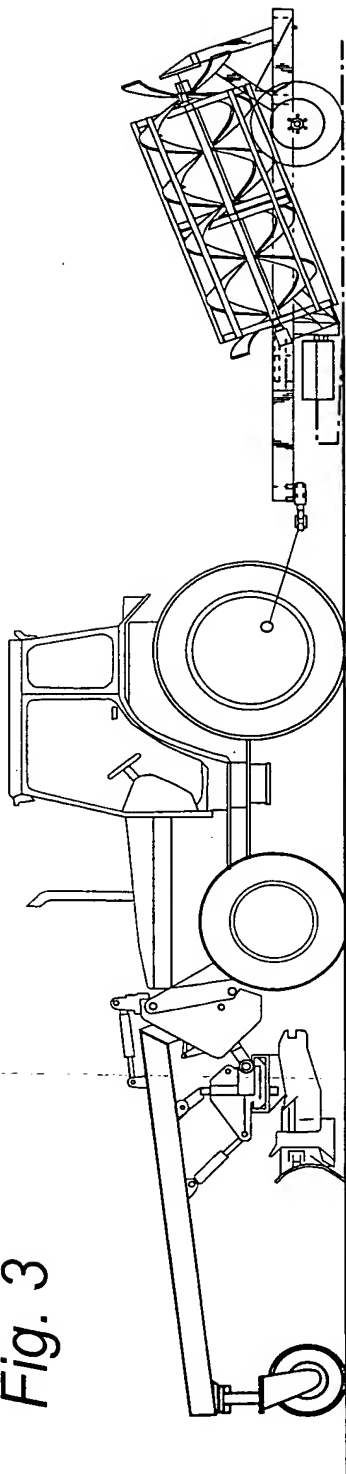


Fig. 5

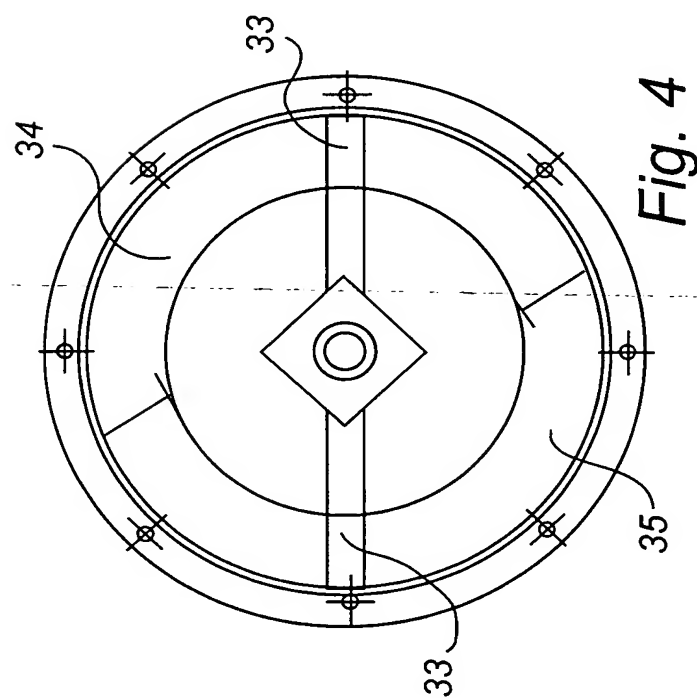


Fig. 4

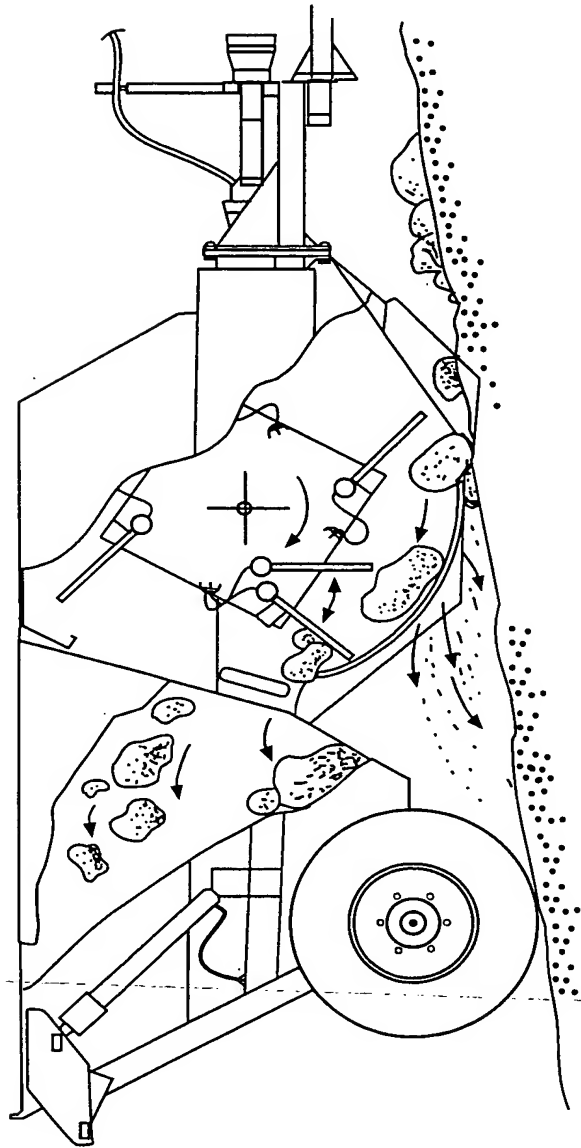


Fig. 6 (Känd teknik)

AWAPATENT AB

Kontor/Handläggare
Malmö/Mikael Gunnarsson

PCT/SE 00 / 0 1 6 3 3
-09- 2000
NIMEK INDUSTRIES NYA AB

Ansökningsnr

Vår referens

1

GRUSSORTERARE

Tekniskt område

Föreliggande uppfinning avser en mobil grussortere-
rare, som är anordnad att förflyttas i en färdriktning
längs med en väg, omfattande en upptagningsenhet som är
5 anordnad att upptaga kornformigt material från en vägbana
vid förflyttning av grussorteraren i färdriktningen, en
sorteringsenhet för utsortering och till vägbanan avgi-
vande av den mängd av materialet som understiger en viss
given kornstorlek, vilken sorteringsenhet omfattar en i
10 färdriktningen efter upptagningsenheten anordnad, väsent-
ligen cirkulär trumma som har en geometrisk centrumaxel,
ett inloppsorgan i anslutning till upptagningsenheten och
ett utloppsorgan som är anordnat i anslutning till upp-
samlingsenheten och i trummans längdriktning åtskilt från
15 inloppsorganet, en uppsamlingsenhet för uppsamling av ma-
terial överstigande nämnda givna kornstorlek, och ett
sållduksorgan som är anordnat att täcka öppningar i trum-
mans mantelyta.

Teknisk bakgrund

20 Såsom beskrivs i broschyren "vägunderhåll barmark"
utgiven av svenska vägverket förslits och nedkrossas en
grusvägs slitlager genom påverkan av trafik och nedhyv-
ling. Det grövre materialet krossas till sandigt mate-
rial. Fint material dammar bort och en del grusmaterial
25 kastas ut i slänten. Slitlagret förvandlas till ett kor-
rugeringskänsligt grus med överskott av sandfraktionen.
Efter en tid har grusvägen fått så dålig standard avse-
ende slitlagrets sammansättning, tjocklek samt försämrad
ytvattenavrinning, att åtgärder för att förbättra slit-
30 lager och vattenavrinning är nödvändiga.

En rätt avvägd åtgärds cykel, för att vidmakthålla
acceptabel ytvattenavrinning och rätt sammansatt slit-

lager är viktigt för att erhålla lägsta totala grusvägsundershållskostnad.

Det finns idag i Sverige ca 284 000 km enskilda vägar som år efter år grusas med ett nytt lager grus. Detta medför dels höga kostnader och dels en märkbar miljöbelastning, eftersom grus börjar bli en bristvara. Gruset som förts på vägarna har dock inte försvunnit, utan merparten har pressats ut i diken.

Enligt kända metoder och med utnyttjande av kända vägmaskiner genomförs underhållet genom att man tillsätter grus- och stenmaterial med en fraktion av 4-18 mm, vilket är den ideala storleken på grus- och stenmaterial för att god bärighet skall erhållas, och eventuellt kantskär och drar in det utkastade materialet. Det material som kasat ut i slänten har en relativt hög andel av material med en storlek i den övre delen av ovannämnda fraktion, varför det är högintressant att återvinna denna materialmängd.

Det indragna materialet är ibland mycket torvigt och innehåller en del relativt stora stenar och kan därför inte användas direkt eftersom detta skulle ge en materialblandning på vägen som skulle resultera i en väg med alltför dålig bärighet.

I broschyren "vägunderhåll barmark" beskrivs två olika sätt att behandla det indragna materialet.

Enligt det första alternativet lastas den indragna strängen i en hjullastares galler-vibratorskopa, medelst vilken för stora stenar och grästorvor sorteras bort. Efter sortering töms kvarvarande material i omgivande terräng om så är möjligt. Enligt detta förfarande behövs en väghyvel, som kantskär och drar in materialet, och en hjullastare med gallervibratorskopa, vilket innebär att det behövs två förare.

Enligt det andra alternativet används en sk stenplockare (principskiss, se fig 6). Stenplockaren hängs direkt på väghyveln eller efter en separat traktor som kör efter väghyveln. En sådan stenplockare, som är ut-

vecklad för att plocka upp stenar ute på åkermark, har ett antal armar som roterar kring en axel som ligger parallellt med markytan och tvärs vägens längdriktning. Armarna träffar stenar och tovor som ligger i den indragna strängen och kastar dessa upp i en behållare. I och med att tovor kastas upp i behållaren följer en stor andel grus med upp i behållaren.

Enligt det första alternativet krävs det flera maskiner som går i följd efter varandra och därmed flera förare. Enligt det andra alternativet försvinner en alltför stor andel grus.

I SE-451 207 beskrivs en sorteringsmaskin för på stället återutnyttjande av väggrus i material från vägunderhåll, såsom avhyvlade sidosträngar och kantmassor. Sorteringsmaskinen har ett uppsamlingsaggregat som samlar upp materialet, ett transportband som transporterar materialet från uppsamlingsaggregatet upp till en horisontellt anordnad tumlare som avskiljer väggruset och deponerar det på stället. Sorteringsenheten har vidare ett andra transportband som för oönskade stenar och liknande från det upptagna materialet upp till en . Sorteringsenheten är försedd med en motor och är självgående. Också vid denna konstruktion behövs det två operatörer, en som kör vägskrapan och en som kör sorteringsenheten.

Både stenplockaren och sorteringsenheten kommer till korta när det är ojämna mängder uppskrapat material utmed vägens längd. De klarar inte av att jämna ut mängden material utmed vägens längd, utan det utsorterade väggruset kommer också att lägga sig ojämnt.

30

Sammanfattning av uppfinningen

Ett ändamål med uppfinningen är att åstadkomma en lösning på de ovanstående relaterade problemen.

Ett annat ändamål är att åstadkomma en lösning där det krävs så få personer (förare) som möjligt och där behovet av tillskott av nytt grus minimeras.

35

Dessa ändamål uppnås med en mobil grussortare som är av det inledningsvis angivna slaget och kännetecknas av att sorteringsenheten omfattar en i färdriktningen efter upptagningsenheten anordnad, väsentligen cirkulär trumma som har en geometrisk centrumaxel, ett inloppsorgan i anslutning till upptagningsenheten och ett utloppsorgan som är anordnat i anslutning till uppsamlingsenheten och i trummans längdriktning åtskilt från inloppsorganet, åtminstone en skruvtransportör som sträcker sig i trumman mellan inloppsorganet och utloppsorganet kring en geometrisk skruvaxel som är väsentligen koncentrisk med trummans centrumaxel, och ett sållduksorgan som är anordnat att täcka öppningar i trummans mantelyta.

Föredragna utföringsformer av uppfinningen framgår av de underordnade patentkraven.

Med fördel har skruvtransportören i radiell riktning en utsträckning understigande trummans inre radie och sträcker sig från insidan av trummans mantelyta så att en axiellt riktad returkammare bildas kring centrumaxeln mellan trummans inlopps- och utloppsorgan. Detta gör att i de fall då mycket material matas in i grussorteren kan det material som överstiger volymen av det utrymme som definieras av kommer detta att kunna återföras till tidigare liggande gängvarv, vilket gör att allt material hinner bearbetas och avges genom sålldukens maskor.

Företrädesvis är tumman och skruvtransportören anordnade att rotera tillsammans som en enhet. Detta gör att man undviker problem med att material fastnar mellan två relativt varandra rörliga element, varvid man undviker att grussorterarens sorteringsenhet kärvar.

Kort beskrivning av ritningarna

Uppfinningen kommer att beskrivas närmare i det följande under hänvisning till bifogade schematiska ritningar som i exemplifierande syfte visar en för närvarande föredragen utföringsform av uppfinningen.

Fig 1 visar den mobila grussorteraren rakt från sidan.

Fig 2 visar den mobila grussorteraren med borttagen kåpa rakt från sidan.

5 Fig 3 visar ett exempel på hur den mobila grussorteraren kan hängas på efter en traktor.

Fig 4 visar den mobila grussorterarens trumma och skruvtransportör sett från inloppet längs med deras centrumaxlar.

10 Fig 5 visar den mobila grussorterarens trumma och skruvtransportör i ett snitt liknande fig 4 på avstånd från inloppet.

Fig 6 visar en stenplockare enligt känd teknik.

15 Beskrivning av föredragen utföringsform

Grussorteraren omfattar som huvudenheter ett chassi 10, en upptagningsenhet 20, en sorteringsenhet 30 och en uppsamlingsenhet 40 (se fig 1 och 2).

20 Chassit 10 består av Y-formad ramkonstruktion 11-13 och är anordnat att hängas efter en väghyvel, traktor, hjullastare eller liknande, via en koppling 14 i änden av den ensamma i Y:et nedre och för chassit främre skänkeln 11. I den bakre delen av chassit, på de båda från varandra åtskilda i Y:et övre och för chassit bakre skänk-
25 larna 12, 13 är två hjul 15, 16 monterade på vilka grussorteraren rullar fram längs med den väg som skall bearbetas.

Upptagningsenheten 20 är uppbyggd av profiler 21, 22 som är anordnade att föra samman materialet i den upp-
30 dragna strängen och föra detta till sorteringsenhetens 30 inloppsöppning 31.

Sorteringsenheten 30 uppbärs av och roterar med sin centrumaxel 32 (se fig 2, 4 och 5). På denna centrumaxel 32 är på tre ställen, de båda ändarna och i mitten, två
35 motstående radiellt riktade stag 33 monterade. Stagen 33 uppbär i sin tur två flänsar 34, 35 som i vars en skruvlinje, i radiell riktning på avstånd från centrumaxeln

32, sträcker sig längs med centrumaxeln 32. Stagen 33 sträcker sig en kort sträcka utanför de skruvgängsformade flänsarna 34, 35 och uppbär en ring 36 (en vid vardera änden och en vid mitten av centrumaxelns längdriktning).
5 Dessa ringar 36 bildar tre cirkelkonturer av en cylinder och utanpå dessa ringar 36 fastgörs självbärande sållduk 37 så att de förbinds med varandra och så att en cylindrisk trumma bildas. Sållduken 37 är tillverkad av flätat 5 mms fjäderstål och har maskor med en storlek av ungefär
10 10% större önskad maximal storlek. Den härvid bildade sorteringsenheten 30 har en form som påminner om en mutter med två gängingångar. Den korta sträcka som stagen 33 sträcker sig utanför flänsarna 34, 35 gör att det bildas en spalt mellan det yttre materialet (sållduken 37) och
15 gängorna (flänsarna 34, 35) som överbryggas av stagen 33.

Sorteringsenheten 30 är upphängd i chassit 10 så att dess centrumaxels 32 projektion på vägbanan är parallell med färdriktningen, med en lutning av ungefär 20° i förhållande till horisontalplanet så att dess främre ände är
20 lägre belägen än dess bakre ände. Centrumaxelns 32 främre ände är anordnad att passa i ett lagringssäte 17 placerat i chassit 10 ungefär där Y:ets nedre, ensamma skänkel övergår i de två övre skänklarna. I den andra änden av centrumaxeln 32 uppbärs den av chassit 10 medelst en upp-
25 rättstående ramkonstruktion 18.

På centrumaxelns 32 bakre ände är en planetväxel 38 och en direkt därpå monterad hydraulisk motor 39 anordnade. Planetväxeln 38 och motorn 39 är dimensionerade att fungera som lagringspunkt för uppbärning av sorteringsen-
30 heten 30. Därvid erhålls ett enkelt och robust system där man endast behöver ett enkelt urtag i chassits 10 ramkonstruktion 18 i vilket motorn 39 och planetväxeln 38 placeras, varefter motorn 39 rotationsmässigt fastgörs medelst bultar.

35 Oljetryck till hydraulmotorn 39 tillförs via en till dragfordonets hydraulsystem ansluten snabbkoppling och i chassit 10 anordnade ledningar.

De skruvformade flänsarna 34, 35 har en utsträckning i radiell led som understiger avståndet mellan centrumaxeln 32 och sållduken 37 och är anordnade på invid sållduken 37 (med en liten spalt), vilket gör att det bildas
5 ett öppet utrymme i mitten av trumman kring centrumaxeln 32 (se fig 5). Precis vid ingången till flänsarnas 34, 35 skruvform har flänsarna 34, 35 dock en utsträckning i radiell led som endast är något mindre än det radiella avståndet mellan centrumaxeln 32 och sållduken 37. Denna
10 utformning har visat sig vara fördelaktig avseende inmatning och kvarhållning av material.

Längst bak på grussoterarens chassi 10 är en uppsamlingsenhet 40 anordnad. I denna uppsamlingsenhet 40 tas det material upp som inte passerat genom maskorna i sållduken 37 under den tid och sträcka som materialet har be-
15 arbetats och förts genom sorteringsenheten 30. Det uppsamlade materialet, såsom t ex större stenar, gräsrötter och växtdelar, är sådant material som man inte önskar ha i vägens bärlager, eftersom det inverkar negativt på bär-
20 eller slitlagrets bärförmåga.

Den beskrivna, mobila grussorteraren är framförallt ägnad att användas vid underhåll av redan befintliga grusvägar, där man försöker återvinna det grus som kasat-
ner i slänten på grund av att vägen använts och påverkats
25 av väder och vind. Det i slänten nerkasade materialet dras upp med hjälp av en skrapa eller hyvel, monterad på en traktor eller väghyvel, och dras samman i en sträng på vägen. Grussorterarens dragfordon kör över strängen som samlas ihop av grussorterarens upptagningsenhet 20 och
30 förs vidare in sorteringsenheten 30. I den roterande sorteringsenheten 30 förs materialet vidare uppåt tack vare den skruvrörelse som flänsarna 34, 35 uppvisar. Stenar och grus understigande en viss given storlek ramlar genom sålldukens 37 maskor ned på vägen. Under den tid det tar
35 för materialet att vandra genom sorteringsenheten 30 dras alla tovor sönder, vilket gör att all grus som är bunden i dessa frigörs och ramlar ned på vägen. Större stenar

och växtdelar ramlar inte genom sållduken 37 och transporteras vidare till uppsamlingsenheten 40.

Eftersom det finns ett öppet utrymme i kring centrumaxeln 32 kan material falla tillbaka till början av
5 sorteringsenheten, i de fall då facken, som definieras av materialets rasvinkel, sållduken 37 och flänsarna 34, 35, blir överfulla. Detta gör att man säkerställer att allt material verkligen hunnit bearbetats och fått chansen att falla genom sållduken 37 innan det förs till uppsamlings-
10 enheten 40. Eftersom sållduken 37 endast släpper genom en viss materialmängd per tidsenhet (eller vägsträcka vid konstant hastighet längs vägen) ger det fria utrymmet också en utjämnande effekt, vilket förhindrar att sorteringsenheten 20 kärvar och ser till att det avges ungefär
15 samma mängd material längs med vägsträckningen. Såsom nämnts tidigare har flänsarna 34, 35 i den första delen av sina vindlingar, eller gångvarv, en radiell utsträckning som är sådan att det fria utrymmet är mycket mer begränsat, vilket gör att det tillbakarasande materialet
20 hålls kvar i sorteringsenheten 30 (se fig 5).

Genom att utforma och använda sorteringsenheten 30 på detta sätt återvinns så stor andel av det grusmaterial som kasats ut i slänten att man i flera fall inte behöver tillföra något nytt material till vägens slitlager.

25 Uppsamlingsenheten 40 kan manövreras och tömmas med hjälp av en hydraulkolv 41. I många fall är det enklaste sättet att tömma uppsamlingsenheten 40 helt enkelt att backa ut grussorteraren så att uppsamlingsenheten 40 är utanför vägen och även ett eventuellt dike, och sedan
30 bara tömma ut materialet.

För att det skall vara rimligt att svänga så pass att man kan "knäcka" ut grussorteraren så kraftigt när man backar bör dragfordonet ha relativt god manöverförmåga. En lämplig konstellation är användandet av en hjulförsedd påhängsväghyvel som kopplas framtill på en traktor eller hjullastare och en grussorterare som är anordnad att hängas på traktorns trepunktslyft (se fig 3).
35

Denna konstellation klarar då att medelst hyveln dra upp släntmaterialet och medelst grussorteraren föra tillbaka det till vägen. Då grussorterarens uppsamlingsenhet 40 skall tömmas kan man lyfta upp hyveln och därmed kan
5 dragfordonet svänga relativt kraftigt och vika ut grussorteraren utanför vägen. Uppsamlingsenheten öppnas och med hjälp av traktorns trepunktslyft tippas hela grussorteraren. Denna konstellation gör det möjligt för en enda person att med en enda körning underhålla en väg och
10 återanvända släntmaterialet.

I de fall det inte går eller är lämpligt ur natur-skyddssynpunkt att tömma grussorteraren direkt vid vägkanten kan den givetvis tömmas i en traktorskopa eller liknande.

15 Det inses att en mängd modifieringar av den här i exemplifierande syfte beskrivna utföringsformen av grussorteraren är möjliga inom ramen för uppfinningen, vilken definieras i de efterföljande patentkraven.

PATENTKRAV

1. Mobil grussorterare, som är anordnad att förflyttas i en färdriktning längs med en väg, omfattande en upptagningsenhet (20) som är anordnad att upptaga kornformigt material från en vägbana vid förflyttning av grussorteraren i färdriktningen, en sorteringsenhet (30) för utsortering och till vägbanan avgivande av den mängd av materialet som understiger en viss given kornstorlek, vilken sorteringsenhet omfattar en i färdriktningen efter upptagningsenheten anordnad, väsentligen cirkulär trumma som har en geometrisk centrumaxel (32), ett inloppsorgan i anslutning till upptagningsenheten (20) och ett utloppsorgan som är anordnat i anslutning till uppsamlingsenheten (40) och i trummans längdriktning åtskilt från inloppsorganet, en uppsamlingsenhet (40) för uppsamling av material överstigande nämnda givna kornstorlek, och ett sållduksorgan (37) som är anordnat att täcka öppningar i trummans mantelyta, **k ä n n e t e c k n a d** av att sorteringsenheten (30) vidare omfattar åtminstone en skruvtransportör (34, 35) som sträcker sig i trumman mellan inloppsorganet och utloppsorganet kring en geometrisk skruvaxel som är väsentligen koncentrisk med trummans centrumaxel (32), att skruvtransportören som huvudelement omfattar åtminstone en radiellt riktad fläns (34, 35) som beskriver en skruvlinje inuti trumman, att skruvtransportörens radiellt riktade fläns i radiell riktning har en utsträckning understigande trummans inre radie och sträcker sig från insidan av trummans mantelyta så att en axiellt riktad returkammare bildas kring centrumaxeln (32) mellan trummans inlopps- och utloppsorgan,

att trummans centrumaxels (32) projektion på vägbanan är riktad väsentligen parallell med grussorterarens färdriktning, varvid inloppsorganet huvudsakligen utgörs av en öppen i färdriktningen främre ände hos trumman och
5 utloppsorganet huvudsakligen utgörs av en öppen i färdriktningen bakre ände hos trumman, och

att sorteringsenhetens (30) centrumaxel (32) är lutad i förhållande till horisontalplanet så att dess främre ände är lägre belägen än dess bakre ände.

10 2. Grussorterare enligt krav 1, vid vilken trumman och skruvtransportören roterar tillsammans.

3. Grussorterare enligt något av kraven 1-2, vid vilken trummans mantelyta huvudsakligen utgörs av nämnda sällduksorgan (37).

15 4. Grussorterare enligt något av föregående krav, vid vilken sorteringsenheten omfattar en med trummans geometriska centrumaxel koncentrisk, bärande, roterande axel (32) som uppbär skruvtransportören och trumman.

20 5. Grussorterare enligt något av föregående krav, vid vilken sorteringsenhetens (30) centrumaxels (32) lutning är ungefär 20° i förhållande till horisontalplanet.

SAMMANDRAG

En mobil grussortare, som är anordnad att förflyttas i en färdriktning längs med en väg, omfattande en upptagningsenhet som är anordnad att upptaga kornformigt material från en vägbana vid förflyttning av grussortaren i färdriktningen, en sorteringsenhet (30) för utsortering och till vägbanan avgivande av den mängd av materialet som understiger en viss given kornstorlek, och en uppsamlingsenhet för uppsamling av material överstigande nämnda givna kornstorlek. Sorteringsenheten (30) omfattar en i färdriktningen efter upptagningsenheten anordnad, väsentligen cirkulär trumma som har en geometrisk centrumaxel (32), ett inloppsorgan i anslutning till upptagningsenheten och ett utloppsorgan som är anordnat i anslutning till uppsamlingsenheten och i trummans längdriktning åtskilt från inloppsorganet, åtminstone en skruvtransportör (34, 35) som sträcker sig i trumman mellan inloppsorganet och utloppsorganet kring en geometrisk skruvaxel som är väsentligen koncentrisk med trummans centrumaxel (32), och ett sållduksorgan (37) som är anordnat att täcka öppningar i trummans mantelyta.

25

30

Publiceringsbild: fig 2

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

Awapatent AB
Box 5117
200 71 MALMÖ

RECEIVED

2001-03-26

AWAPATENT, Malmö

NOTIFICATION OF RECEIPT OF DEMAND BY COMPETENT INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

(PCT Rules 59.3(e) and 61.1(b), first sentence
and Administrative Instructions, Section 601(a))

Date of mailing
(day/month/year)

23-03-2001

Applicant's or agent's file reference

2001880

IMPORTANT NOTIFICATION

International application No.

PCT/SE00/01633

International filing date (day/month/year)

24-08-2000

Priority date (day/month/year)

24-08-1999

Applicant

**Nimek Industries Nya Aktiebolag
et al**

1. The applicant is hereby notified that this International Preliminary Examining Authority considers the following date as the date of receipt of the demand for international preliminary examination of the international application:

23-03-2001

2. This date of receipt is:

- ☒ the actual date of receipt of the demand by this Authority (Rule 61.1(b)).
- ☐ the actual date of receipt of the demand on behalf of this Authority (Rule 59.3(e)).
- ☐ the date on which this Authority has, in response to the invitation to correct defects in the demand (Form PCT/IPEA/404), received the required corrections.

3. ☐ **ATTENTION:** That date of receipt is **AFTER** the expiration of 19 months from the priority date. Consequently, the election(s) made in the demand does (do) not have the effect of postponing the entry into the national phase until 30 months from the priority date (or later in some Offices) (Article 39(1)). Therefore, the acts for entry into the national phase must be performed within 20 months from the priority date (or later in some Offices) (Article 22). For details, see the *PCT Applicant's Guide*, Volume II.

- ☐ (If applicable) This notification confirms the information given by telephone, facsimile transmission or in person on:

4. Only where paragraph 3 applies, a copy of this notification has been sent to the International Bureau.

vbi
MGN

Name and mailing address of the IPEA/

Patent- och registreringsverket
Box 5055
S-102 42 STOCKHOLM
Facsimile No. 08-667 72 88

Telex
17978
PATOREG-S

Authorized officer

Telephone No. 08-782 25 00 **Jan-Erik Karlsson**

PATENT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

AWAPATENT AB
BOX 5117
S-200 71 Malmö
SUÈDE

RECEIVED

2001-03-09

AWAPATENT, Malmö

Date of mailing (day/month/year) 01 March 2001 (01.03.01)		
Applicant's or agent's file reference 2001880 / MGN		
IMPORTANT NOTICE		
International application No. PCT/SE00/01633	International filing date (day/month/year) 24 August 2000 (24.08.00)	Priority date (day/month/year) 24 August 1999 (24.08.99)
Applicant NIMEK INDUSTRIES NYA AKTIEBOLAG et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AU, KP, KR, US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
AE, AG, AL, AM, AP, AT, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EA, EE, EP, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OA, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU,
The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).
3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 01 March 2001 (01.03.01) under No. WO 01/14643

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

MGN

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

RECORD COPY

PCT REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty

For receiving Office use only	
PCT/ SE 00 / 0 1 6 3 3	
International Application No.	
International Filing Date	24 -09- 2000
Name of receiving Office and "PCT International Application"	
Applicant's or agent's file reference 2001880 (if desired)(12 characters maximum)	

Box No. I TITLE OF INVENTION	
GRAVEL SORTER	
Box No. II APPLICANT	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	<input type="checkbox"/> This person is also inventor.
NIMEK INDUSTRIES NYA AKTIEBOLAG	Telephone No.
Box 153	Facsimile No.
S-830 47 TRÅNGSVIKEN	Teleprinter No.
Sweden	
State (that is, country) of nationality: Sweden	State (that is, country) of residence: Sweden
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input checked="" type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Box No. III FURTHER APPLICANT(S) AND/OR /FURTHER INVENTOR(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	This person is:
NILSSON, Nils, Lennart	<input type="checkbox"/> applicant only
Wolfsgatan 2	<input checked="" type="checkbox"/> applicant and inventor
S-962 32 JOKKMOKK	<input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)
Sweden	
State (that is, country) of nationality: Sweden	State (that is, country) of residence: Sweden
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
<input type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet	
Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
The person identified below is/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	<input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	Telephone No.
AWAPATENT AB	+46 40 98 51 00
Box 5117	Facsimile No.
SE-200 71 MALMÖ	+46 40 26 05 16
SWEDEN	Teleprinter No.
<input type="checkbox"/> Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent	

Sheet No. 2

Box No. V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☒ **AP** **ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA** **Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** **European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA** **OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|---|---|
| <input checked="" type="checkbox"/> AE United Arab Emirates | <input checked="" type="checkbox"/> LC Saint Lucia |
| <input checked="" type="checkbox"/> AG Antigua and Barbuda | <input checked="" type="checkbox"/> LK Sri Lanka |
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LR Liberia |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AT Austria +Utility Model | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MA Morocco |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BZ Belize | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> MZ Mozambique |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CR Costa Rica | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CZ Czech Republic +Utility Model | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> DE Germany +Utility Model | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DK Denmark +Utility Model | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> DM Dominica | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> DZ Algeria | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> EE Estonia +Utility Model | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> FI Finland +Utility Model | <input checked="" type="checkbox"/> SK Slovakia +Utility Model |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GD Grenada | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TZ United Republic of Tanzania |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IN India | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> ZA South Africa |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | |
| <input checked="" type="checkbox"/> KR Republic of Korea +Utility Model | |
| <input checked="" type="checkbox"/> KZ Kazakhstan | |

Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet:

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

24 -08- 2000

Sheet No. 3

Box No. VI PRIORITY CLAIM				
<input type="checkbox"/> Further priority claims are indicated in the Supplement Box.				
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application:* regional Office	international application: receiving Office
item (1) 24 August 1999 (24.08.99)	9902985-2	SWEDEN		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): 1

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA)
(If two or more International Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA /

Request to use results of earlier search; reference to that search

(if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year)

Number

Country (or regional Office)

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets:

request : 3 ✓
description (excluding sequence listing part) : 9 ✓
claims : 2 ✓
abstract : 1 ✓
drawings : 3 ✓
sequence listing part of description :

Total number of sheets : 18

Figure of the drawings which should accompany the abstract: 2

This international application is accompanied by the item(s) marked below:

1. ☐ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney; reference No., if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international applications into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☒ other (specify): **Subauthorisation, copy of Official Action**

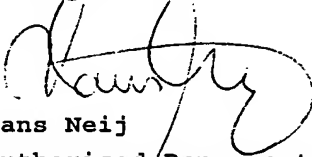
Language of filing of the international application:

Swedish

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

24 August 2000



Hans Neij

Authorised Representative

For receiving Office use only		2. Drawings: <input checked="" type="checkbox"/> received: <input type="checkbox"/> not received:
1. Date of actual receipt of the Purported international application:	24 -08- 2000	
3. Corrected date of actual receipt due to later but Timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required Corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent):	IS/SE	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.

Date of receipt of the record copy by the International Bureau:

8 SEPTEMBER 2000

18 SEP 2000

Form PCT/RO/101 (last sheet) (July 1998; reprint July 2000)

See Notes to the request form